

PCT

REC'D 19 OCT 2001

WIPO PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference ICOY/P23098PC	<b>FOR FURTHER ACTION</b> See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/GB00/02497	International filing date (day/month/year) 28/06/2000	Priority date (day/month/year) 30/06/1999
International Patent Classification (IPC) or national classification and IPC A61K48/00		
Applicant IMPERIAL COLLEGE INNOVATIONS LIMITED et al.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.



2. This REPORT consists of a total of 9 sheets, including this cover sheet.

☐ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☒ Priority
- III ☒ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☒ Certain documents cited
- VII ☒ Certain defects in the international application
- VIII ☐ Certain observations on the international application

Date of submission of the demand 25/01/2001	Date of completion of this report 17.10.2001
Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer Mueller, F Telephone No. +49 89 2399 7722 

# INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/GB00/02497

## I. Basis of the report

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

**Description, pages:**

1-50 as originally filed

**Claims, No.:**

1-52 as originally filed

**Drawings, sheets:**

1/6-6/6 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:—

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:

# INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/GB00/02497

☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

*(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)*

6. Additional observations, if necessary:

## II. Priority

1. ☐ This report has been established as if no priority had been claimed due to the failure to furnish within the prescribed time limit the requested:

☐ copy of the earlier application whose priority has been claimed.

☐ translation of the earlier application whose priority has been claimed.

2. ☐ This report has been established as if no priority had been claimed due to the fact that the priority claim has been found invalid.

Thus for the purposes of this report, the international filing date indicated above is considered to be the relevant date.

3. Additional observations, if necessary:  
**see separate sheet**

## III. Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

1. The questions whether the claimed invention appears to be novel, to involve an inventive step (to be non-obvious), or to be industrially applicable have not been examined in respect of:

☐ the entire international application.

☒ claims Nos. 1-19,23-25,43,50-52.

because:

☒ the said international application, or the said claims Nos. 1-19,23-25,43,50-52 relate to the following subject matter which does not require an international preliminary examination (*specify*):  
**see separate sheet**

☐ the description, claims or drawings (*indicate particular elements below*) or said claims Nos. are so unclear that no meaningful opinion could be formed (*specify*):

☐ the claims, or said claims Nos. are so inadequately supported by the description that no meaningful opinion

# INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/GB00/02497

could be formed.

☐ no international search report has been established for the said claims Nos. .

2. A meaningful international preliminary examination cannot be carried out due to the failure of the nucleotide and/or amino acid sequence listing to comply with the standard provided for in Annex C of the Administrative Instructions:

☐ the written form has not been furnished or does not comply with the standard.

☐ the computer readable form has not been furnished or does not comply with the standard.

## V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

### 1. Statement

Novelty (N)	Yes:	Claims	3,10,11,13-15,17-19,25-37,40,41,43,45,47,49
	No:	Claims	1,2,4,5,6,7,8,9,12,16,20-24,38,39,42,44,46,48,50-52
Inventive step (IS)	Yes:	Claims	
	No:	Claims	1-52
Industrial applicability (IA)	Yes:	Claims	1-52 (?)
	No:	Claims	

2. Citations and explanations  
**see separate sheet**

## VI. Certain documents cited

1. Certain published documents (Rule 70.10)

and / or

2. Non-written disclosures (Rule 70.9)

**see separate sheet**

## VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:  
**see separate sheet**

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT - SEPARATE SHEET**

---

International application No. PCT/GB00/02497

**Re Item II**

**Priority**

The subject-matter of claim 32 which refers to a portion of a c-terminal domain of vErbA,T3R,T3Rbeta1 and T3Ralpha is not entitled to the claimed priority.

Nevertheless the cited document in the International Search Report (Chien et al.,) is not considered as prior art.

**Re Item III**

**Non-establishment of opinion with regard to novelty, inventive step and industrial applicability**

Claims 1-16,18,19,25,43 as far as an in vivo method is concerned and claims 17,23 and 24 relate to subject-matter considered by this Authority to be covered by the provision of Rule 67 (iv) PCT. Consequently, no opinion will be formulated with respect to the industrial applicability of the subject-matter of these claims (Article 34(4)(a)(i) PCT).

A partial International search was established for the subject-matter of claims 50-52. The search was restricted to the compounds/methods which were defined by the desired characteristics of suppressing the activity of a selected gene. Consequently the opinion of this communication is also limited to these features.

**Re Item V**

**Reasoned statement under Article 35(2) PCT with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

Reference is made to the following documents:

D1: GRIGNANI FRANCESCO ET AL: NATURE (LONDON), vol. 391, no. 6669,  
19 February 1998 (1998-02-19), pages 815-817,

- D2: BEERLI ROGER R ET AL: PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES, vol. 95, no. 25, December 1998 (1998-12), pages 14628-14633, XP002924795 Dec., 1998
- D3: HSIEH JAMES J -D ET AL: PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES, vol. 96, no. 1, 5 January 1999 (1999-01-05), pages 23-28,
- D4: WO-A-9923885
- D5: WO-A-0041566

2. The subject-matter of independent claim 1 is not novel (Article 33 (2) PCT).

D1 describes a RAR-alpha-PLZF fusion protein which is acting as a repressor on gene transcription of a selected gene(see abstract). The fusion protein is repressing the transcription by acting through modification of chromatin by histone deacetylase (see abstract and p.816, 1.col. 1. and 2. par. and figure 5.b). Experiments on gene expression using this fusion protein were carried out in U397 cells on TGase expression (see figure 4). All technical features are described in D1 therefore novelty of claim 1 can not be acknowledged.

- 2.1 The subject-matter of claim 1 is also not novel (Article 33 (2) PCT) over D2.

D2 describes zinc finger-repressor constructs for controlling gene expression. A zinc finger binding domain, recognizing the erbB-2 gene was fused to three domains (KRAB, ERD, SID (mSin3)), see abstract and p. 14628, 2.col. 2. par. The function of sin3 for recruiting and facilitating the generation of a HDAC is considered to be well known in the prior art (see also present application p. 3, 1.5-16). The function of these fusion proteins on gene expression and silencing was tested by using a luciferase reporter gene assay in human epithelial cells (see p. 14628, 2.col. 2. par.; p.14632, 2.col. 2. par. Furthermore D2 discusses the use of such fusion proteins in gene therapy for inhibiting the production of viral gene products and for producing gene knockouts transgenic animals (p.14633, 2.col.). Thus the subject-matter of claim 1 is described in D2.

- 2.2 The subject-matter of independent claim 1 is also not novel (Article 33 (2) PCT

over D3.

D3 describes a Gal4-CIR fusion protein (see abstract) which is used over its binding to histone deacetylase and SAP30 for repressing gene expression. The function of this fusion protein as a repressor molecule is tested in HeLa cells by using a CAT-reporter system. (see p. 25, 2.col. 2.par.). Furthermore D3 refers on p. 27, 2.col. ,1.par. in a general statement to the involvement of histone deacetylation in gene repression (reference is also made to sin3, see also item 2.1 above).

Thus all technical features of claim 1 are disclosed in D3 novelty can not be acknowledged.

2.4 The same holds true for the subject-matter of claims 2,4,5,6,7,8,9,12,16,38,39,42, 44,46,48 and 50-52.

2.5 The subject-matter of dependent claims 3,10,11,13-15 and 17-19 are not inventive (Article 33 (3) PCT).

As the general method for suppressing genes by using fusion proteins of a DNA binding domain and a chromatin inactivating protion (e.g. aHDAC recruiting domain) are already disclosed in the prior art (D1-D3) the subject-matter of the claims 3,10,11,13-15 and 17-19 seems not to introduce additional technical features which can be acknowledged as inventive (Article 33 (3) PCT).

3. The subject-matter of independent claim 20 is not novel (Article 33 (2) PCT). As already laid out, see item 2, fusion proteins consisting of a DNA<sub>binding</sub> domain and a chromatin inactivating domain are known from the prior art and are used for repressing selected genes (e.g. for knockouts see D2). Thus novelty for claim 20 can not be acknowledged.

3.1 The same holds true for independent claims 21,23,24 and dependent claim 22.

4. The subject-matter of claims 25,26,27,28,29,30,31,32,33,34,35,36,37,40, 41,43,45,47 and 49 is novel (Article 33 (2) PCT).

4.1 The subject-matter of claims 25,26,27,28,29,30,31,32,33,34,35,36,37,40, 41,43,45,47 and 49 is not inventive (Article 33 (3) PCT).

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/GB00/02497

The prior art (D1-D3) already describes fusion proteins consisting of a DNA binding portion and a chromatin inactivation portion which is used for repressing the transcription of selected genes. In addition the prior art already refers to the use of such fusion proteins to selectively knockout genes in transgenic animals (see D2) and their use in neoplastic diseases (see D1, p.817, last par.). In addition D4 describes fusion proteins comprising a Gal4 DNA binding domain and a domain which is operatively associated with histone deacetylase (see claims 10-12, and e.g. figure 3c) for screening of compounds which are modulating nuclear receptor mediated processes (p. 4, l.19-p.5,l.19). Thus the use of these fusion proteins in medicine and their preparation in pharmaceutical compositions as well as their use in bacterial host cells and in transgenic plants are considered not to introduce additional technical features over the prior art which involve an inventive step (Article 33 (3) PCT).

**Re Item VI**

**Certain documents cited**

Certain published documents (Rule 70.10)

Application No Patent No	Publication date (day/month/year)	Filing date (day/month/year)	Priority date (valid claim) (day/month/year)
WO0041566	20.07.2000	06.01.2000	12.01.1999

The intermediate document D5 discloses methods for regulating endogenous gene expression by using zinc finger proteins and fusion proteins thereof (see claims 1,5 and 16).

Therefore it could play a role in the national or regional phase (EPO (Article 54(3) EPC) in respect of novelty , namely to claims 1,20,23-32,34,37,44.

**Re Item VII**

**Certain defects in the international application**

Contrary to the requirements of Rule 5.1(a)(ii) PCT, the relevant background art disclosed in the documents D2,D3,D4 and D5 is not mentioned in the description, nor are these documents identified therein.



**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT - SEPARATE SHEET**

---

International application No. PCT/GB00/02497